

**SOURCES, GENES FOR RESISTANCE, AND PEDIGREES OF 52 RUST AND MOSAIC RESISTANT DRY BEAN GERMPLASM LINES RELEASED BY THE USDA BELTSVILLE BEAN PROJECT IN COLLABORATION WITH THE MICHIGAN, NEBRASKA AND NORTH DAKOTA AGRICULTURAL EXPERIMENT STATIONS**

**M. A. Pastor-Corrales**

USDA-ARS, Plant Sciences Institute, Vegetable laboratory, Beltsville, MD 20705-2350

**25 PINTO LINES**

**1988, 2 Releases: Beldak-RR-1, and -2.** Rust resistant, high yielding, type III, viny. **Resistance sources and genes:** BDK-RR-1 and -2 were developed for resistance to the 33 races of the rust pathogen available at the time of their release. They are resistant to all of the 90 races identified later. Their resistance is derived from Compuesto Negro Chimaltenango (CNC), Mexico 235 (*Ur-3+*), and Olathe (*Ur-6+*). The resistance in CNC has not yet been characterized but it is resistant to 83 of the 90 races of the rust pathogen maintained at Beltsville. **Pedigree:** BelDak-RR-1 and BelDak-RR-2 are selections from the cross Bel 4-2537/3/Bel 4-844\*2//Olathe/Mexico 235. Bel 4-844 derived from the cross Fiesta\*2//olathe\*3/CNC and Bel 4-2537 from Fiesta\*3//Olathe\*3/CNC. **USDA Release Note:** Stavely, J. R., and Grafton, K. F. 1988. Release of two pinto dry bean germplasm lines, Beldak-rust resistance-1 and -2. U.S. Department of Agriculture and North Dakota Agricultural Experiment Station. Germplasm release Notice. 3pp. **Published.** Stavely, J. R., and Grafton, K. F. 1989. Registration of Beldak-rust resistance -1 and -2 dry bean germplasm. *Crop Science* 29(3): 834-835.

**1992, 4 Releases: BelDakMi-RR-1, -2, -3, and -4.** Rust resistant, narrow profile, upright, short vine, type II, relatively early maturing. **Resistance sources and genes:** These are the first type II pinto beans that derive their resistance to all 64 races of the bean rust pathogen available at the time of their release from PI 151388 or PI 181996 (*Ur-11*). The resistance in PI 151388 has not been characterized but it is similar to that of PI 181996. BDM-RR-1 is homozygous for the resistance genes present in PI 151388, PX-057 (*Ur-6+*, Olathe genes) and for the *bc-2*<sup>2</sup> common mosaic recessive resistance gene. BDM-RR-2 is homozygous for the rust resistance genes in PI 181996 or 151388 but it is not homozygous for the second resistance gene in PX-057 that is present in BDM-RR-1. BDM-RR-3 is homozygous for the resistance genes in PI 181996 or 151388 and in PX-057. BDM-RR-4 is homozygous for the genes in PI 181996 or 151388 but has not additional rust resistance genes and it also has the *bc-1*. **Pedigree:** The pedigree of BDM-RR-1 is PX-004/4/PX-057/3/PX-010\*2//Fiesta\*3/PI 151388. The pedigree of BDM-RR-2 is PX-057//Bel 1-2547-1/Bel 1-2545-1. Bel 1-2547-1 was an F<sub>1</sub> plant from PX-010\* 2//Fiesta\* 2/PI 151388 and Bel 1-2545-1 is an F<sub>1</sub> plant from PX-010/4/86263\* 2//Fiesta/PI 181996. BDM-RR-3 and BDM-RR-4 are derived from Sierra//Bel 1-2547-1/Bel 1-2545-1. **USDA Release Note:** Stavely, J. R., Grafton, K. F., and Kelly, J.D. 1992. Release of four upright, short vine pinto bean germplasm lines, BelDakMi-Rust Resistant-1, -2, -3, and -4. U.S. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1993, 5 Releases: BelDakMi-RR-5, -6, -7, -8, and -9.** Rust resistant, narrow profile, upright, short vine, type II, relatively early maturing. **Resistance sources and genes:** All five released lines

derive their rust resistance to all 65 races of the rust pathogen in the Beltsville collection available at the time of their release from PI 181996 or 190078. Both PIs are sources of the *Ur-11* rust resistance gene that is effective against 89 of the 90 races presently maintained at Beltsville. BDM-RR-5, -6, and -7 are homozygous for the genes in PI 181996 (*Ur-11*), 87-039-34 (*Ur-6*+, Olathe genes), *I*, and a recessive gene that provides partial protection of *I* against of BCMNV. The rust resistance of BDM-RR-8 and -9 is similar to that of BDM-RR-5, -6, -7, but the *Ur-11* rust resistance gene is derived from PI 190078. The BCMV resistance in BDM-RR-8 appeared diffuse green instead of local lesions and no systemic symptoms with NL3, plus apparent immunity to other strains but that of BDM-RR-9 is similar to that of BDM-RR-5, -6, -7. **Pedigree:** BDM-RR-5, BDM-RR-6, and BDM-RR-7 are derived from 87-039-34\*2/Bel 2-2193. Bel 2-2193 is derived from P86263/4/Sierra/3/P86263//Fiesta\*2/PI 181996. BDM-RR-8 and BDM-RR-9 are derived from 87-039-34/4/Sierra/3/PX004//Sierra/PI 190078. **USDA Release Note:** Stavely, J. R., Grafton, K. F., and Kelly, J.D. 1993. Release of five upright, short vine pinto bean germplasm lines, BelDakMi-Rust resistant -5, -6, -7, -8, and -9. U.S. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1995, 1 Release: BelDakMi-RMR-10.** Rust and mosaic resistant, high yielding, upright, short vine, type II. **Resistance sources and genes:** This is the first released pinto line to combine resistance from PI 190078 (*Ur-11*) to all 66 available races of the rust pathogen maintained at Beltsville at the time of their release and one of the rust resistance genes in Olathe (*Ur-6*), with the homozygous recessive *bc-u* and *bc-2*<sup>2</sup> genes and the homozygous dominant *I* gene that together provide resistance to all strains of bean common mosaic virus (BCMV) and bean common mosaic necrosis virus (BCMNV). The resistance sources are PI 190078 (*Ur-11*), 87-039-34 (*Ur-6*, Olathe gene), and 92US-1006 (*bc-u*, *bc-2*<sup>2</sup>, and *I*). **Pedigree:** BDM-RMR-10 has the pedigree 92 US-1006/8/88-011-03\*2/6/Aztec/5/87-039-34\*2/3/PX010//Fiesta/PI 190078. **USDA Release Note:** Stavely, J. R., Grafton, K. F., Kelly, J.D. and Silbernagel, M.J. 1995. Release of BelDakMi-RMR-10 erect, short vine, rust and mosaic resistant pinto bean germplasm. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1997, 3 Releases: BelDakMi-RMR-11, -12, and -13.** Rust and mosaic resistant, high yielding, upright, short vine, type II. **Resistance sources and genes:** These are the first pinto beans to combine resistance from PI 190078 (*Ur-11*) to 86 of 87 races of bean rust and the *Ur-6* rust resistance gene that is in Olathe, with homozygous recessive *bc-3* gene that provides resistance to all known strains of BCMV and BCMNV. The source for *Ur-6*, *bc-3* and type II growth habit was pinto line P94232 from J. D. Kelly. None of these lines contain the dominant allele of the *I* gene for resistance to many strains to BCMV. **Pedigree:** The pedigree of BMD-RMR-11 (tested as 4-12223), BDM-RMR-12 (tested as 4-12228), and BDM-RMR-13 (tested as 4-12255) is 94232\*2/8/92BR3-1084B/7/92 BR-1006/6/88-011-03\*2/5/Aztec/4/87-039-34\*2//3/PX010//Fiesta/PI 190078. **USDA Release Note:** Stavely, J. R., Grafton, K. F., and Kelly, J.D. 1997. Release of BelDakMi-RMR-11, -12, and -13 erect, short vine, rust and mosaic resistant pinto bean germplasm lines. Germplasm release Notice. 3pp.

**1998, 1 Releases: BelDakMi-RMR-14.** Rust and mosaic resistant, high yielding, upright short vine, type II. **Resistance sources and genes:** This is the first released bean to combine the *Ur-3*, *Ur-6* and *Ur-11* genes for rust resistance that provide resistance to all 90 races of the rust pathogen maintained at Beltsville and the *bc-3* and *I* for resistance to all strains of BCMV and BCMNV. PI

190078 is the source of *Ur-11* that is effective against 89 of the 90 races of the rust pathogen. The single race for which *Ur-11* is not effective (race 108) is controlled by *Ur-3* that is effective against 45 of the other races. Michigan pinto bean P94232 and Kodiak are the sources of *Ur-3*, *Ur-6*, and type II growth habit. Line P94232 is the source of *bc-3* and several pinto parents were the sources of *I*. **Pedigree:** The pedigree of BDM-RMR-14 is Kodiak/9/P94232\*2/8/92 BR-3-1084B/7/92 BR3-1006B/6/88-011-03\*2/5/ Aztec/4/87-039-34\*2/3/P0X10//Fiesta/PI190078. **USDA Release Note:** Stavely, J. R., Grafton, K. F., and Kelly, J.D. 1998. Release of BelDakMi-RMR-14 erect, short vine, rust and mosaic resistant pinto bean germplasm line. U.S. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp

**1999, 4 Releases; BelDakMi-RMR-15, -16, -17, and -18.** Rust and mosaic resistant, high yielding, upright short vine, type II. **Resistance sources and genes:** All four lines are resistant to all 90 races of the rust pathogen maintained at Beltsville and to all strains of BCMV and BCMNV. BDM-RMR-15, -16, -16 and -17 combine the *Ur-3*, *Ur-6*, and *Ur-11* rust resistance genes with the *bc-3* and *I* mosaic resistance genes. BDM-RMR-18 is the first bean of any class to have four genes for rust resistance. This is the first bean to combine the *Ur-4* rust resistance gene with *Ur-3*, *Ur-6* and *Ur-11*. BDM-RMR-18 also has *bc-3* and *I*. BDM-RMR-15, -16, -16, -17 and -18 have the same sources of rust, BCMV and BCMNV resistance as BDM-RMR-14. The source of the *Ur-4* rust resistance gene in BDM-RMR-18 is the great northern line BelMiNeb (BMN)-RMR-3 into which *Ur-4* had been introgressed from BelMiDak(BDM)-RR-2 navy line. The source of *Ur-4* in BDM-RR-2 was Early Gallatin. The single race of the rust pathogen for which *Ur-11* is not effective, is controlled by *Ur-3* in BDM-RMR-15, -16, and -17 and by *Ur-3* and *Ur-4* in BDM-RMR-18. **Pedigree:** BMD-RMR-15, BDM-RMR-16, and BDM-RMR-17 were selected from bulked F<sub>5</sub> generation seed from successive generations of single plant selections from different F<sub>3</sub> plants of line 3-7449 that had *Ur-6* and *Ur-3* recombined with *Ur-11*. The pedigree of 3-7449 and these lines is Kodiak/9/P94232\*2/8/92 BR-3-1084B/7/BR3-1006/6/88-011-03\*2/5/ Aztec/4/87-039-34\*2/3/P0X10//Fiesta/PI190078. BDM-RMR-18 is from crossing an F<sub>5</sub> plant from a sib of the 3-7449 parents of BDM-RMR-15, -16, and -17 with a selected plant of line BMN-RMR-3 that has *Ur-4*, *Ur-11*, *bc-3* and *I* and the pedigree G94567/4/G91213\*2/3/Starlight\*2//Alpine\*3/BelMiDak-RR-2. The pedigree of BDM-RR-2 is Mayflower/4/4-5753/3/Mayflower/NX-040/PI 181996. The pedigree of 4-5753 is C20\*5/Early Gallatin. **USDA Release Note:** Stavely, J. R., Grafton, K. F., and Kelly, J.D. 1999. Release of BelDakMi-RMR-15, -16, -17, and -18 erect, short vine, rust and mosaic resistant pinto bean germplasm lines. U.S. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**2003, 5 Releases; BelDakMi-RMR-19, -20, -21, -22, and -23.** Rust and mosaic resistant, high yielding, upright short vine, type II. **Resistance sources and genes:** BDM-RMR-19, -20, -21, -22, and -23 are resistant to all 90 races of the rust pathogen maintained at Beltsville and to all strains of BCMV and BCMNV. These five lines combine the *Ur-4* rust resistance gene with *Ur-3*, *Ur-6* and *Ur-11* and the *bc-3* and *I* genes for mosaic resistance. BDM-RMR-19, -20, -21, -22, and -23 have the same sources of rust, BCMV and BCMNV resistance as BDM-RMR-18. **Pedigree:** The pedigree of BMD-RMR-19 (Tested as 5-2455) is 5-3352//5-3374/BMN-RMR-3. The pedigree of both 5-3352 and 5-3374 is Kodiak/9/P94232\*2/8/92 BR-3-1084B/7/BR3-1006/6/88-011-03\*2/5/ Aztec/4/87-039-34\*2/3/P0X10//Fiesta/PI190078. BDM-RMR-20 (Tested as 6-2285), BDM-RMR-21 (tested as 6-2073), BDM-RMR-22 (tested as 6-2188), and BDM-RMR-23 (tested as 6-2149) are derived from crossing an F<sub>5</sub> plant from a sib F<sub>3</sub> of the 3-7449 parents of BDM-RMR-15, -16, and -

17 (with *Ur-6* and *Ur-3* recombined with *Ur-11* and *bc-3 and I*) with a selected plant of great northern line BMN-RMR-3 with *Ur-4*, *Ur-11*, *bc-3* and *I* and the pedigree 94567/4/G91213\*2/3/Starlight\*2//Alpine\*3/BelMiDak-RR-2. The pedigree of BDM-RR-2 is Mayflower/4/4-5753/3/Mayflower//NX-040/PI 181996. The pedigree of 4-5753 is C20\*5/Early Gallatin. **USDA Release Note:** Pastor Corrales, M. A., Grafton, K. F., and Kelly, J.D. 2003. Release of BelDakMi-RMR-19, -20, -21, -22, and - 23 erect, short vine, rust and mosaic resistant pinto bean germplasm lines. U.S. Department of Agriculture, North Dakota and Michigan Agricultural Experiment Stations. Germplasm release Notice. 3pp.

## 15 GREAT NORTHERN LINES

**1988, 2 Releases: Belneb-RR-1, and -2.** Rust, common and halo blight, and common mosaic resistant, high yielding, type 3, viny. **Resistance sources and genes:** These were the first great northern dry beans developed for resistance to the 33 races of the rust pathogen available at the time of their release. The sources of rust resistance are B-190 (*Ur-5*), Olathe (*Ur-6+*) and GN 1140 (*Ur-7*). GN Harris is a source of common bacterial and halo blight resistance. Belnebe-RR-1 and -2 are homozygous for *bc-1<sup>2</sup>* and *bc-2<sup>2</sup>* genes that condition resistance to BCM and BCMNV. **Pedigree:** Belneb-RR-1 and -2 were developed by crossing B-190 with GN 1140 and then backcrossing a rust resistant F<sub>1</sub> plant, in succeeding generations, with GN 1140, Olathe, and Harris as a recurrent parent. The pedigree is GN Harris\*3/6/Olathe/3/GN1140//B190/GN1140. **USDA Release Note:** Stavely, J. R., Steadman, J. R., and Coyne, D.P. 1988. Release of two great northern dry bean germplasm lines, Belneb-Rust Resistant-1 and -2. U.S. Department of Agriculture and Nebraska Agricultural Experiment Station. Germplasm release Notice. 3pp. **Published.** Stavely, J. R., Steadman, J. R., Coyne, D. P., and Lindgren, D. T. 1989. Belneb Rust Resistance-1 and -2 Great Northern Dry Bean Germplasm. HortScience 24(2): 400-401.

**1993, 2 Releases: BelMiNeb-RR-1 and -2.** Rust resistant, high yielding, erect and narrow profile, short vine (type II), medium maturing. **Resistance sources and genes:** These are the first great northern beans to derive their resistance to all 65 races of the rust pathogen maintained at Beltsville at the time of their release, from PI 181996 (*Ur-11*). Early Gallatin was the source of *Ur-4*. BMN-RR-1 is homozygous for *Ur-11*, *Ur-4*, *I* and a recessive *bc* gene that provides partial protection to *I* gene against strains of BCMNV. BMN-RR-2 is homozygous for *Ur-11*; does not contain *Ur-4* or *I*, but it is resistant to Western, NY 15, and Mexican strains of BCMV. **Pedigree:** BMN-RR-1 and BMN-RR-2 have the same pedigree: Alpine\*3/BelMiDak-RR-2. BMD-RR-2 is a selection from the cross Mayflower/4/4-5753/3/Mayflower//NX 040/PI 181996. The pedigree of Beltsville line 4-5753 is C20\*5/Early Gallatin. **USDA Release Note:** Stavely, J. R., Kelly, J. D. Steadman, J. R., Coyne, D.P., and Lindgren, D. T. 1993. Release of two erect, short vine, great northern bean germplasm lines, BelMiNeb-Rust Resistant-1 and -2. U.S. Department of Agriculture, Michigan and Nebraska Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1996, 1 Release: BelMiNeb-RMR-3.** Rust and mosaic resistant, high yielding, upright short vine (type II). **Resistance sources and genes:** This is the first released great northern bean to combine resistance to all 87 races of the bean rust fungus, maintained at Beltsville at the time of their release, with resistance to all strains of BCMV and BCMNV. PI 1818996 is the source of *Ur-11* that is effective against all but one race of the rust pathogen maintained at Beltsville. The single race for which *Ur-11* is not effective (race 108) is controlled by *Ur-4*. This gene is many snap

beans cultivars and was introgressed from snap bean Early Gallatin to navy lines BelMiDak-RR-1, -2 and others released in 1991. BMN-RMR-3 is also homozygous for *bc-3* and *I*. Michigan great northern line G94567 has type II growth habit and was the source of the *bc-3* and *I* for mosaic resistance. **Pedigree:** G94567/8/G91213\*2/6/Starlight\*2/4/Alpine\*3/BelMiDak-RR-2. See the pedigree of BMD-RR-2 in BMN-RR-1 and -2. **USDA Release Note:** Stavely, J. R., Kelly, J. D. Steadman, J. R., Coyne, D.P., and Lindgren, D. T. 1996. Release of BelMiNeb-RMR-3, erect, short vine rust and mosaic resistant great northern bean germplasm. U.S. Department of Agriculture, Michigan and Nebraska Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1998, 2 releases: BelMiNeb-RMR-4, and -5.** Rust and mosaic resistant, high yielding, upright short vine, type II, early maturing. **Resistance sources and genes:** These are the first great northern beans to combine three major genes that provide resistance to all 89 races of the rust pathogen and two genes for resistance to all strains of BCMV and BCMNV. The sources of resistance are PI 1818996 (*Ur-11*), Early Gallatin (*Ur-4*), G94567 (*Ur-6* and *I*) and G91213 (*bc-1<sup>2</sup>*). **Pedigree:** The pedigree of both lines is G94567\*2/4/G91213\*2/3/Starlight\*2/4//Alpine\*3/BelMiDak-RR-2. **USDA Release Note:** Stavely, J. R., Kelly, J. D. Steadman, J. R., Coyne, D.P., and Lindgren, D. T. 1998. Release of BelMiNeb-RMR-4 and -5 erect, short vine rust and mosaic resistant great northern bean germplasm lines. U.S. Department of Agriculture, Michigan and Nebraska Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1999, 2 Releases: BelMiNeb-RMR-6 and -7.** Rust and mosaic resistant, high yielding, upright short vine, type II. **Resistance sources and genes:** Both lines are resistant to all 90 races of the rust pathogen maintained at Beltsville and to all strains of BCMV and BCMNV. BMN-RMR-6 has the same genes for rust and mosaic resistance that are in BMN-RMR-4 and -5. BMN-RMR-7 is the first released great northern bean to combine the *Ur-3* with the *Ur-4* and *Ur-11* rust resistance genes. The single race (108) of the rust pathogen for which *Ur-11* is not effective, is controlled by *Ur-4* in BMN-RMR-6 and -7, as well as by *Ur-3* in BMN-RMR-7. BMN-RMR-6: PI 1818996 (*Ur-11*), Early Gallatin (*Ur-4*); G91213 (*bc-1<sup>2</sup>*) and *I*. BMN-RMR-7: PI 181996 and PI 190078 (*Ur-11*), Kodiak (*Ur-3* and *Ur-6*), Early Gallatin (*Ur-4*), G94567 (*bc-3*) and *I*. Several parental lines were sources of *I* in BMN-RMR-6 and -7. **Pedigree:** The pedigree of BMN-RR6 is: G94567\*2/4/G91213\*2/3/Starlight\*2//Alpine\*3/BelMiDak-RR-2. BMN-RMR-7 is derived from crossing an F<sub>5</sub> pinto plant homozygous for the recombined *Ur-3* and *Ur-11* genes with pollen from great northern germplasm release BMN-RMR-3. The pedigree of the pinto parent is Kodiak/9/P94232\*2/8/92 BR-3-1084B/7/BR3-1006/6/88-011-03\*2/5/ Aztec/4/87-039-34\*2/3/P0X10//Fiesta/PI190078. See the pedigree of BMN-RMR-3 above. **USDA Release Note:** Stavely, J. R., Kelly, J. D. Steadman, J. R., Coyne, D.P., and Lindgren, D. T. 1999. Release of BelMiNeb-RMR-6 and -7 erect, short vine, rust and mosaic resistant great northern bean germplasm lines. U.S. Department of Agriculture, Michigan and Nebraska Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**2003, 6 Releases; BelMiNeb-RMR-8, -9, -10, -11, -12, and -13.** Rust and mosaic resistant, high yielding, upright short vine, type II. **Resistance sources and genes:** These are the first great northern bean lines to combine four genes for resistance to the common bean rust pathogen with two genes for resistance to BCMV and BCMNV. These lines are resistant to all known races of the bean rust pathogen and all strains of bean common mosaic (BCMV) and bean common mosaic necrosis (BCMNV) viruses. The sources of resistance are PI 181996 and 190078 (*Ur-11*), BDM-

RR-2 (*Ur-4*, derived from Early Gallatin), Kodiak (*Ur-3*, *Ur-6*), P94232 (*bc-3*), pinto parents (*I*). **Pedigree:** BMN-RMR-8, -9-10, -11, -12, and -13 were selected from bulked F<sub>5</sub> generation seeds derived from crossing an F<sub>5</sub> pinto plant homozygous for *Ur-6* and *Ur-3* recombined with *Ur-11* genes and for *bc-3* and *I* with pollen from a selected plant of the great northern germplasm released line BMN-RMR-3 that has *Ur-4*, *Ur-11*, *bc-3* and *I*. The pedigree of the F<sub>5</sub> pinto parent used in this cross to produce BMN-RMR-8, -9-10, -11, -12, and -13 is: Kodiak/9/P94232\*2/8/92 BR-3-1084B/7/BR3-1006B/6/88-011-03\*2/5/ Aztec/4/87-039-34\*2/3/P0X10//Fiesta/PI 190078. The pedigree of BMN-RMR-3 is G94567/4/G91213\*2/3/Starlight\*2//Alpine\*3/BMD-RR-2. The pedigree of BMD-RR-2 is Mayflower/4/4-5753/3/Mayflower//NX 040/PI 181996. The pedigree of 4-5753 is C-20\*5/Early Gallatin. **USDA Release Note:** Pastor Corrales, M. A., J. R., Kelly, J. D. Steadman, J. R., Coyne, D.P., and Lindgren, D. T. 2003. Release of BelMiNeb-RMR-8, -9, -10, -11, -12, and -13 erect, short vine, rust and mosaic resistant great northern bean germplasm lines. U.S. Department of Agriculture, Michigan and Nebraska Agricultural Experiment Stations. Germplasm release Notice. 3pp.

## 12 NAVY LINES

**1991, 7 Releases: BelMiDak-RR-1, -2, -3, -4, -5, -6, and -7.** Rust resistant, high yielding, erect, narrow profile, short vine, type II, relatively early maturing. **Resistance sources and genes:** BelMiDak-RR-1, -2: Bel 4-5753 (*Ur-4* from Early Gallatin), PI 181996 (*Ur-11*). BelMiDak-RR-3, -5, -6, and -7: PI 181996 (*Ur-1*) and *I*. BelMiDak-RR-4: *Ur-11* (PI 181996). **Pedigree:** The pedigree of BMD-RR-1, BDM-RR-2, and BMD-RR-3 is Mayflower/4/4-5753/3/Mayflower//NX-040/PI 181996. The pedigree of BMD-RR-4 is: Mayflower\*3//NX-040/PI 181996. The pedigree of BMD-RR-5 and BMD-RR-6 is NX-040/4/4-5753/3/Mayflower//NX-040/PI 181996. The pedigree of BelMiDak-RR-7 is 4-5753\*2/3/Mayflower//NX040/PI 181996. **USDA Release Notice:** Stavely, J. R., Kelly, J. D., and Grafton, K. F. 1991. Release of seven erect, short vine navy bean germplasm lines, BelMiDak-Rust Resistant-1, -2, -3, -4, -5, -6, and -7. U.S. Department of Agriculture, Michigan and North Dakota Agricultural Experiment Stations. Germplasm release Notice. 3pp. **Published.** Stavely, J. R., Kelly, J. D., and Grafton, K. F. 1994. BelMiDak-Rust Resistant Navy Dry Beans Germplasm Lines. HortScience 29(6): 709-711.

**1993, 2 Releases: BelMiDak- RR-8 and -9.** Rust resistant, high yielding, erect and narrow profile, short vine, type II, relatively early maturing. **Resistance sources and genes:** Bel 4-5753 (*Ur-4* from Early Gallatin), PI 181996 (*Ur-11*), and homozygous for the *I* gene and for a recessive *bc* that provides partial protection of the *I* gene against strains of BCMNV. BMD- RR-9 segregating for *bc*. **Pedigree:** The pedigree of BMD-RR-8 is Northstar/BelMiDak-RR-1 and the pedigree of BMD-RR-9 is Mayflower/BelMiDak-RR-2. **USDA Release Notice:** Stavely, J. R., Kelly, J. D., and Grafton, K. F. 1993. Release of two erect, short vine navy bean germplasm lines, BelMiDak-Rust Resistant-8, and -9. U.S. Department of Agriculture, Michigan and North Dakota Agricultural Experiment Stations. Germplasm release Notice. 3pp. **Published.** Stavely, J. R., Kelly, J. D., and Grafton, K. F. 1994. BelMiDak-Rust Resistant Navy Dry Beans Germplasm Lines. HortScience 29(6): 709-711.

**1994, 2 Releases: BelMiDak-RMR-10, and -11.** Rust and mosaic resistant, high yielding, narrow profile, upright, short vine, type II, early maturing. **Resistance sources and genes:** Early Gallatin (*Ur-4*), PI 181996 (*Ur-11*); I90-302 (*bc-3* and *I*). Both lines released were segregating for *I*.

**Pedigree:** The pedigree of BMD-RMR-10 is I 90-302\*2//NX041/BelMiDak-RR-1 and of BMD-RMR-11 is I 90-302\*2//Norstar/BelMiDak-RR-1. **USDA Release Notice:** Stavely, J. R., Kelly, J. D., Grafton, K. F., and Silbernagel. M.J. 1994. . Release of two erect, short vine navy bean germplasm lines, BelMiDak-Rust Resistant-10, and -11. U.S. Department of Agriculture, Michigan and North Dakota Agricultural Experiment Stations. Germplasm release Notice. 3pp.

**1995, 1 Release: BelMiDak-RMR-12.** Rust and mosaic resistant, high yielding, narrow profile, upright, short vine, type II. **Resistance sources and genes:** Early Gallatin (*Ur-4*), PI 181996 (*Ur-11*), I90302 and N93018 (*bc-3* and *I*). **Pedigree:** The pedigree of BMD-RR-12 is: N93018/4/I 90-302\*2//Norstar/BelMiDak-RR-1. **USDA Release Notice:** Stavely, J. R., Kelly, J. D., Grafton, K. F., and Silbernagel. M.J. 1995. . Release of erect, short vine navy bean germplasm line BelMiDak-Rust Resistant-12. U.S. Department of Agriculture, Michigan and North Dakota Agricultural Experiment Stations. Germplasm release Notice. 3pp.